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Mr. William F. Caton
Secretary
Federal Communications Commission
1919 M Street, NW
Washington, DC 20054

FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

Re: WT Docket No. 96-86

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Dear Mr. Caton:

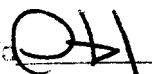
Please find attached an original and one copy of the Final Report of the Public Safety Wireless Advisory Committee to be included in the public record in the above captioned docket.

Please feel free to call me if you have any questions or need additional information.

Sincerely,


Philip L. Verveer

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

Honorable Reed Hundt
Chairman
Federal Communications Commission
1919 M Street, N.W.
Washington, D.C. 20554

Honorable C. Larry Irving, Jr.
Assistant Secretary
National Telecommunications and
Information Administration
Department of Commerce
15th and Pennsylvania Ave., N.W.
Washington, D.C. 20230

Dear Chairman Hundt and Assistant Secretary Irving:

I am pleased to submit the Final Report of the federal advisory committee on Public Safety Wireless frequency and related requirements through the year 2010.

The Final Report consists of the Steering Committee's findings and recommendations and of summaries of the work of the advisory committee's five subcommittees. The subcommittees' contributions are annexed to the Final Report. The subcommittee reports comprise a collection of, and learned commentary upon, most of the available information about the contemporary radio communications needs of the public safety community and the opportunities to meet those needs. Most of the value of the advisory committee effort resides in these subcommittee reports; the value will be realized to the extent that the subcommittee reports are used as source documents for policy decisions in the future.

The Final Report reflects the substantial voluntary effort of hundreds of federal, state, and local officials, and others who are personally or professionally interested in public safety.

The Final Report has benefited from very generous contributions by the distinguished members of the Steering

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Honorable Reed Hundt
Honorable C. Larry Irving, Jr.
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Committee. They contributed both their own time and expertise, and in many instances made exceptionally talented professional colleagues available to work with the committee on an ongoing basis. The manufacturing representatives on the Steering Committee also made available nationally recognized experts to assist with the committee's work.

Most of the advisory committee's work was accomplished in the five subcommittees. The subcommittees were very ably led by individuals who have dedicated their professional lives to the application of technology to public safety. The subcommittee chairs, and in some instances their alternates, conducted meetings throughout the country to gather the information and undertake the analysis that forms the foundation for the Final Report. They carried the heaviest burden of the advisory committee effort. To the extent that the Final Report and the annexed materials make a genuine contribution our country, most of the credit goes to them and to the individuals and institutions that participated so generously in the subcommittee process.


The Final Report itself was compiled by a drafting committee composed of federal, state, and local "end users" of public safety radio communications: Ray Barnett of the United States Secret Service, Department of the Treasury, Steven Proctor, Technical Manager for Communications, State of Utah, and Michael Amarosa, Deputy Commissioner for Technology and Systems Development, Police Department of the City of New York. Commissioner Amarosa's colleagues, Lts. Ted Dempsey and Bob Mason of the New York Police Department, also participated in every facet of the compilation of the Final Report.

Finally, I am grateful to both of you for according me the privilege of working on this project with so many of our county's most dedicated public officials. I am especially grateful to you for making available for this project many of your best professionals at a time when there have been so many competing claims on your agencies' resources. I was genuinely honored to have the opportunity to work with them this past year--most extensively with John Logan, David Wye, Ralph Haller, Robert McNamara,

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Kathryn Hosford, John Borkowski, and Joy Alford of the FCC
and W. Donald Speights and Michael Biggs of NTIA.

Sincerely,


Philip L. Verveer

FINAL REPORT
OF THE
PUBLIC SAFETY WIRELESS
ADVISORY COMMITTEE

TO THE

FEDERAL COMMUNICATIONS COMMISSION
Reed E. Hundt
Chairman

AND

THE NATIONAL TELECOMMUNICATIONS
AND INFORMATION ADMINISTRATION
Larry Irving
Assistant Secretary of Commerce
for Communications and Information

September 11, 1996

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VOLUME I

This *Final Report* of the Public Safety Wireless Advisory Committee is divided into two volumes.

Volume I contains the main body of the report, including summaries of the various subcommittee reports.

Volume II contains the full text of the subcommittee reports along with their supporting documents, where available.

LIST OF ACRONYMS

AASHTO	American Association of State Highway and Transportation Officials
ACCOLC	Access Overload Class
ADP	Automated Data Processing
AFCEA	Armed Forces Communications and Electronics Association
AHS	Automated Highway System
ALARS	Automobile License and Registry System
ALI	Automatic Location Identification
AMPS	Advanced Mobile Phone System
AMSC	American Mobile Satellite Corporation
ANI	Automatic Number Identification
ANSI	American National Standards Institute
APCO	Association of Public Communications Officials
API	American Paging, Inc.
APL	Automatic Personnel Location
ARQ	Automatic repeat ReQuest
AT&T	American Telephone and Telegraph
ATM	Asynchronous Transfer Mode
ATV	Advanced Television (HDTV)
AVC	Automatic Vehicle Classification
AVI	Automatic Vehicle Identification
AVL	Automatic Vehicle Location
AVM	Automatic Vehicle Monitoring
AWGN	Additive White Gaussian Noise
BER	Bit Error Rate
BIFC	Boise Inter-agency Fire Cache
BPA	Bonneville Power Administration
BTA	Basic Trading Area
CAD	Computer-Aided Dispatch
CAI	Common Air Interface
CAP	Competitive Access Provider
CBP	Community Based Policing
CCITT	Consultative Committee on International Telephony and Telegraphy
CD-ROM	Compact Disk - Read Only Memory
CDF	California Department of Forestry and Fire Protection
CDMA	Code Division Multiple Access
CDPD	Cellular Digital Packet Data
CELP	Coded Excited Linear Predictive
CFR	Code of Federal Regulations
CGSA	Cellular Geographic Service Area
CHP	California Highway Patrol
CLEC	Competitive Local Exchange Carrier
CMRS	Commercial Mobile Radio Services

CMSS	Commercial Mobile Satellite Systems
COG	Council of Governments
COMSAT	Commercial Mobile Satellite Systems
COPE	Coalition of Private Users of Emerging Multimedia Technologies
COTS	Commercial-off-the-shelf
COW	Cell Sites on Wheels
CPAS	Cellular Priority Access Service
CPC	Channel Performance Criterion
CTIA	Cellular Telecommunications Industries Association
CVSD	Continuously Variable Slope Delta (modulation)
DAQ	Delivered Audio Quality
DCI	Data Collection Instrument
DGPS	Differential Global Positioning Systems
DMAT	Disaster Medical Assistance Team
DMV	Department of Motor Vehicles
DOD	Department of Defense
DOE	Department of Energy
DPI	Dots Per Inch
DRAM	Dynamic Random Access Memory
DSP	Digital Signal Processing
DSRC	Dedicated Short Range Communications
DTMF	Dual-Tone-Multi-Frequency
DTRS	Digital Trunked Radio System
ECC	Emergency Communications Center
EDACS	Enhanced Digital Access Communication System
EDI	Electronic Data Interchange
EDIS	Emergency Digital Information System
EMD	Emergency Management and Disaster Services
EMRS	Emergency Medical Radio Service
EMS	Emergency Medical Services
EOC	Emergency Operations Center
EOD	Explosive Ordnance Disposal
ESMR	Enhanced Specialized Mobile Radio
ETTM	Electronic Toll and Traffic Management
EVM	Emergency Vehicle Management
FCC	Federal Communications Commission
FCCA	Forestry Conservation Communications Association
FCRS	Forestry-Conservation Radio Service
FDMA	Frequency Division Multiple Access
FEC	Forward Error Correction
FEMA	Federal Emergency Management Agency
FFSR	Fast Forward Signal Regeneration
FHWA	Federal Highway Administration

FLEWUG	Federal Law Enforcement Wireless Users Group
FM	Frequency Modulation
FMARS	Fire Mutual Aid Radio System
FPLMTS	Future Public Land Mobile Telecommunications Systems
FQPSK	Feher's Quadrature Phase Shift Keying
FRS	Fire Radio Service
GETS	Government Emergency Telecommunications System
GHz	Gigahertz
GIF	Graphic Image Format
GIS	Geographic Information System
GLONASS	Global Navigation Satellite System
GMF	Government Master File
GMSK	Gaussian Minimum Shift Keying
GOS	Grade of Service
GPS	Global Positioning System
HAZMAT	Hazardous Materials
HDTV	High Definition Television (ATV)
HF-SSB	High-frequency Single-sideband
HIDTA	High Intensity Drug Trafficking Area
HMRS	Highway Maintenance Radio Service
HOV	High Occupancy Vehicle
IAFC	International Association of Fire Chiefs
IAFIS	Integrated Automated Fingerprint Identification System
IC	Integrated Circuit; Incident Commander
ICO	Intermediate Circular Orbit
ICP	Interoperability Communication Plan
ICS	Incident Command System
ICSAR	Interagency Committee on Search and Rescue
iDEN	Integrated Digital Electronic Network
IEEE	Institute of Electrical and Electronics Engineers
IMO	International Maritime Organization
IMSA	International Municipal Signal Association
IMTS	Improved Mobile Telephone Service
INMARSAT	International Maritime Satellite Organization
INS/CECOM	Immigration and Naturalization Service/U.S. Army Communications and Electronics Command
IOC	Initial Operating Capability
IP	Internet Protocol
IPR	Intellectual Property Right
IRAC	Interdepartment Radio Advisory Council
ISC	Interoperability Subcommittee
ISO	International Standards Organization
ISTEA	Intermodal Surface Transportation Efficiency Act

ITS	Intelligent Transportation Systems
ITU	International Telecommunication Union
IVHS	Intelligent Vehicle and Highway Systems
JPEG	Joint Photographic Expert Group
JSMS	Joint Spectrum Management System
KB/S (KBPS)	Kilobytes per Second
KHz	Kilohertz
LAN	Local Area Network
LATA	Local Access Transport Area
LEO	Low Earth Orbit
LGRS	Local Government Radio Service
LMCC	Land Mobile Communications Council
LMR	Land Mobile Radio
LMS	Location and Monitoring Service
LOGIS	Local Government Information System
LPD	Low Probability of Detection
LPI	Low Probability of Intercept
MAP	Mutual Aid Plan
MARISAT	Maritime Satellite
MDT	Mobile Data Terminals
MHz	Megahertz
MMST	Metropolitan Medical Strike Team
MPEG	Motion Picture Expert Group
MPEG-1	Motion Picture Expert Group
MPEG-4	Motion Picture Expert Group
MSA	Metropolitan Statistical Area
MSC	Mobile Switching Center
MSS	Mobile Satellite Systems
MTA	Major Trading Area
MTA-NYCT	Metropolitan Transportation Authority - New York City Transit
MTBF	Mean Time Between Failure
MTSO	Mobile Telephone Switching Office
NAM	Number Assignment Module
NASNA	National Association of State Nine-One-One Administrators
NASTD	National Association of State Telecommunications Directors
NATO	North Atlantic Treaty Organization
NCIC	National Crime Information Center
NCIC-2000	National Crime Information Center Project 2000
NENA	National Emergency Number Association
NFPA	National Fire Protection Association
NIRSC	National Incident Radio Support Cache

NIST	National Institute of Standards and Technology
NITF	National Image Transfer Format
NLETS	National Law Enforcement Telecommunications System
NPR	National Performance Review
NPSPAC	National Public Safety Planning Advisory Committee
NSA	National Security Agency
NSEP	National Security and Emergency Preparedness
NSTAC	National Security Telecommunications Advisory Committee
NTIA	National Telecommunications and Information Administration
NTIAOA	National Telecommunications and Information Administration Organization Act
NTSC	National Television Systems Committee
NTSC	National Television Systems Committee
NTT	Nippon Telegraph and Telephone Corp.
NYCDoITT	New York City Department of Information, Technology, and Telecommunications
OASD	Office of the Assistant Secretary of Defense
OIC	Officer-In-Charge
OMS	Operations and Management Systems
ORBCOMM	Orbital Communications
ORSC	Operational Requirements Subcommittee
OTAR	Over The Air Rekey
PACA	Priority Access and Channel Assignment
PBX	Private Branch Exchanges
PCS	Personal Communications Services
PDA	Personal Digital Assistant
PDT	Portable Data Terminal
PLMR	Private Land Mobile Radio
PMARS	Police Mutual Aid Radio System
PMO	Program Management Office
POTS	Plain Old Telephone System
PPM	Parts Per Million
PRS	Police Radio Service
PSA	Protected Service Area
PSAM	Pilot Symbol Assisted Modulation
PSAP	Public Safety Answering Point
PSCC	Public Safety Communications Council
Ψ (psi)-CELP	Ψ (psi) Coded Excited Linear Predictive
PSRS	Public Safety Radio Services
PSTN	Public Switched Telephone Network
PSWAC	Public Safety Wireless Advisory Committee
PSWN	Public Safety Wireless Network
QPSK	Quadrature Phase Shift Keying

RACES	Radio Amateur Civil Emergency Service
RF	Radio Frequency
RMA	Ranally Metropolitan Area
RPV	Remotely Piloted Vehicle
RSA	Rural Service Area
RZ SSB	Real Zero Single Sideband
SAR	Search And Rescue
SCADA	Supervisory Control and Data Acquisition
SDO	Standards Developing Organization
SERS	Special Emergency Radio Service
SERS	Special Emergency Radio Service
SMR	Specialized Mobile Radio
SOLAS	Safety of Life at Sea
SOP	Standard Operating Procedure
SPEN	State Police Emergency Network
SRSC	Spectrum Requirements Subcommittee
SSB	Single Sideband
SWAT	Special Weapons and Tactics
TAB	Tone Above Band
T/R	Transmit/Receive
TCP/IP	Transmission Control Protocol/Internet Protocol
TCP	Transmission Control Protocol
TDD	Time Division Duplex
TDMA	Time Division Multiple Access
TESC	Technology Subcommittee
TIA	Telecommunications Industry Association
TMC	Traffic Management Center
TRSC	Transition Subcommittee
TSAR	Technical Search and Rescue
TTAB	Transparent Tone Above Band
TTIB	Transparent Tone In Band
TX	Transmit
UDP	User Datagram Protocol
UHF	Ultra High Frequency
USAR	Urban Search and Rescue
USART	Urban Search and Rescue Team; United States Search and Rescue Team
USCG	U.S. Coast Guard
USFS	U.S. Forest Service
USGS	United States Geological Service
UTAM	Unlicensed Transition and Management
UTC	Utilities Communications Council
VHF	Very High Frequency

VOCODER	Voice enCODER
VPAS	Vehicle Proximity Alerting Systems
VSAT	Very-Small Aperture
VSELP	Vector Sum Excited Linear Predictive
VTs	Vehicular Technology Society
WAPA	Western Area Power Administration
WARC	World Administrative Radio Conference
WAWAS	Washington Area Warning and Alerting System
WIM	Weight In Motion
WMATA	Washington Metropolitan Area Transit Authority

EXECUTIVE SUMMARY

Our Nation's highways are one of the major conduits for interstate travel and commerce. Recently, a dramatic, quadruple fatality vehicle accident occurred on a section of one of these interstate highways. A semi tractor/trailer was traveling northbound in the middle lane next to a car moving in the same direction. The car moved out of its lane and became wedged under the tractor/trailer. Subsequently, the truck lost control, crossed the median, and struck another vehicle traveling in the opposite direction. This caused a chain reaction which involved several additional vehicles, and resulted in the closing of the interstate. Due to the severity of the incident, several police agencies, fire rescue units, ambulances and helicopters were involved in the rescue, extrication, and management of the incident. The coordination of the incident was routed through several dispatch facilities and created a major communications challenge to those involved. Having to close the interstate while the situation was cleared resulted in massive traffic jams. Rerouting traffic and ensuring the safety of the traveling public was a priority of the agencies involved.

These types of situations occur at a moment's notice in every city and town across the country. The ability of Public Safety agencies involved in such incidents to communicate is vital to the safety and welfare of the citizens they represent. In times of emergencies, the public looks to government, particularly their Public Safety officials, to act swiftly and correctly and do the things which must be done to save lives, help the injured, and restore order. Most disasters occur without warning, but people still expect a rapid and flawless response on the part of government. There is no room for error. Whether a vehicle accident, crime, plane crash, special event, or any other Public Safety activity, one of the major components of responding to and mitigating a disaster is wireless communications. These wireless communications systems are critical to Public Safety agencies' ability to protect lives and property and the welfare of Public Safety officials.

This report represents the best efforts of the Public Safety community to define and document its critical need for communications resources and the spectrum which will support them — now and through the year 2010.

At the most basic level, radio-based voice communications allow dispatchers to direct mobile units to the scene of a crime and allow firefighters to coordinate and to warn each other of impending danger at fires. Radio systems are also vital for providing logistics and command support during major emergencies and disasters such as earthquakes, riots, or plane crashes. Systems are now being designed to allow transmission of video and broadband data, enabling paramedics to send pictures of injuries to trauma centers while en route, permitting the use of remote controlled robotics to defuse explosives, and making viable the tracking of wildland fires. Thus, radio-based technologies are critical to the effective discharge of Public Safety agencies' obligations, providing a lifeline connecting Public Safety officials to assistance and delivering vital information to help in their critical mission. In an era where

technology can bring news, current events, and entertainment such as the Olympics to the farthest reaches of the world, many police officers, firefighters, and emergency medical service personnel working in the same city cannot communicate with each other. Congested and fragmented spectral resources, inadequate funding for technology upgrades, and a wide variety of governmental and institutional obstacles result in a critical situation which, if not addressed expeditiously, will ultimately compromise the ability of Public Safety officials to protect life and property.

The nation's Public Safety agencies face several important problems in their use of radio communications:

- ▶ *First*, the radio frequencies allocated for Public Safety use have become highly congested in many, especially urban, areas. Usable spectrum for mobile operations is limited, and Public Safety agencies are not able to meet existing requirements, much less to plan for future, more advanced communications needs. Not only does the shortage of spectrum jeopardize the lives and health of Public Safety officials, it threatens their ability to fully discharge their duty to protect the lives and property of all Americans.
- ▶ *Second*, the ability of officials from different Public Safety agencies to communicate with each other is limited. Yet interoperability is key to success in day-to-day operations, joint task force and mutual aid operations, and many other intra- and inter-jurisdictional activities. Interoperability is hampered by the use of multiple frequency bands, incompatible radio equipment, and a lack of standardization in repeater spacing and transmission formats.
- ▶ *Finally*, Public Safety agencies have not been able to implement advanced features to aid in their mission. A wide variety of technologies — both existing and under development — hold substantial promise to reduce danger to Public Safety personnel and to achieve greater efficiencies in the performance of their duties. Broadband data systems, for example, offer greater access to databases and information that can save lives and contribute to keeping criminals “off the street.” Video systems promise better surveillance capabilities, increased use of robotics in toxic and hazardous environments, and better monitoring and tracking of both personnel and equipment.

The *Final Report* concludes that, unless immediate measures are taken to alleviate spectrum shortfalls and promote interoperability, Public Safety agencies will not be able to adequately discharge their obligation to protect life and property in a safe, efficient, and cost effective manner.

To address these and other problems, the Federal Communications Commission (FCC) and the National Telecommunications and Information Administration (NTIA) established the Public Safety Wireless Advisory Committee (PSWAC or Advisory Committee) to evaluate the wireless communications needs of federal, state, and local Public Safety agencies through the year 2010 and recommend possible solutions. The membership of the PSWAC encompassed

a broad range of Public Safety agencies (federal, state, and local), public service providers, equipment manufacturers, commercial service providers, and the public at large. This *Final Report*, drawn from the five attached subcommittee reports on Operational Requirements, Interoperability, Technology, Spectrum Requirements, and Transition, embodies the findings and recommendations of the PSWAC developed over the past year.

Implementing the requirements identified in the report, including transitioning to new bands and meeting minimal interoperability requirements, will require different levels of commitment from various user groups, and close cooperation and open dialogue with regulating officials and the manufacturing community. The recommendations made in the report recognize the substantial embedded infrastructure currently being used by the Public Safety community, the budgetary constraints Public Safety agencies face, and the critical lack of additional funding available to most Public Safety entities as a matter of course. To meet the immediate and future needs of the Public Safety community, the Steering Committee makes the following observations and recommendations:

- ▶ More spectrum is required.
 - ▶ Immediately, 2.5 MHz of spectrum should be identified for interoperability from new or existing allocations.
 - ▶ In the short term (within 5 years), approximately 25 MHz of new Public Safety allocations are needed. The present shortages can be addressed by making part of the spectrum presently used for television broadcast channels 60-69 available as soon as possible.
 - ▶ Over the next 15 years, as much as an additional 70 MHz of spectrum will be required to satisfy the mobile communication needs of the Public Safety community.
- ▶ Improved interoperability is required. Present limitations can be eased by establishing bands of frequencies for interoperability purposes, encouraging the development and use of shared systems, and building gateways between technically incompatible systems.
- ▶ More flexible licensing policies are desirable. The current approach, focused primarily on continuous narrow banding, does not provide the Public Safety community the flexibility of selecting or obtaining the most efficient technology to meet user-defined needs. Policies should encourage the use of the most spectrally efficient approaches while remaining technology neutral.
- ▶ More sharing and joint use should be encouraged. Some states and regions are experiencing considerable success in pooling spectral and other resources. In many instances, perceived losses in terms of independence of operation are more than offset by improvements in function and efficiency. Policies designed

to streamline cooperative use of federal and non-federal spectrum should be adopted.

- ▶ The use of commercial services and private contracts should be facilitated, provided the essential requirements of coverage, priority access and system restoration, security, and reliability are met. These services must be provided on a competitive basis.
- ▶ A continuing consultative process should be established to permit the Public Safety community and the FCC and NTIA to adjust to new requirements and new opportunities. The rapid changes in technology, among other things, make imperative, timely adjustments in the policies and requirements of the government agencies managing spectrum. An arrangement that facilitates continuing consultation between and among institutions responsible for, and interested in, Public Safety will help assure that opportunities for improvement are not missed.
- ▶ Funding limitations will remain a major obstacle in the adoption of needed improvements in Public Safety communications systems. At a time when government budgets are tight, alternative methods of funding future Public Safety communications systems must be identified. Otherwise, the substantial benefits afforded by technology will not be realized.

The Steering Committee believes that no single solution will solve the telecommunications problems confronting Public Safety. Rather, solutions must be tailored to meet the unique needs of each Public Safety agency and the public they serve. The Public Safety community must continue to work together to present its views and make its communications needs known.

1. INTRODUCTION AND BACKGROUND

- 1.1 No responsibility is more fundamental and reflective of the nation's values than that of its Public Safety agencies. The citizens' legitimate expectation is that when their life or property is endangered, their government will respond. Vast federal, state, and local resources are committed to ensure this obligation is met. The effectiveness of police officers, fire fighters, emergency medical services (EMS) personnel, and other Public Safety officials is inextricably tied to communications capability. Today's communications environment, however, impedes meeting this responsibility. Rescuing victims of the World Trade Center bombing, who were caught between floors, was hindered when police officers could not communicate with fire fighters on the very next floor. Similarly, the inability to communicate among the agencies that had rushed to the Oklahoma City bombing site required resorting to runners to relay messages. The lack of sufficient, quality radio spectrum suitable for Public Safety use deters technological innovation, diminishes the responsiveness and effectiveness of Public Safety, and ultimately compromises the safety of the responding officers and of the very individuals seeking their help.
- 1.2 The importance of radio communications to the Public Safety community cannot be overestimated. In a large-scale disaster such as an earthquake, forest fire, or flood, hundreds of agencies and thousands of individuals come together to provide emergency medical assistance, fire suppression, rescue operations, infrastructure repair, crowd control and security, food and shelter, and to begin the process of rebuilding. At a time when other means of communication are likely to be inoperable, Public Safety radio communication systems must provide the lifeline that connects each responder to his or her agency and to each other.
- 1.3 While high profile incidents receive the most attention, even the less dramatic and routine, day-to-day situations require effective radio communications. A trauma victim's ability to survive depends upon receiving prompt medical attention — usually within minutes. Emergency medical providers desire the ability to transmit images and other vital statistics about the injured from the paramedic unit back to trauma centers or hospitals to aid in diagnosis and pre-arrival treatment. Fire officials desire the ability to obtain weather forecasts, building blueprints/designs, information as to the types of hazardous or combustible material that may be on the scene, and other vital information while en route. This information is needed by firefighters for the prompt and safe removal of occupants. Undercover officers must be able to coordinate an ongoing operation or, more rudimentary, call for immediate assistance. A host of other government users, public service providers, and utilities operate radio systems to maintain the infrastructure and services on which the public depends.
- 1.4 Because of the special nature of their missions, Public Safety officials often have unique communication needs. Many users, especially in the Federal government, require secure or encrypted communications to protect their operations. Coverage is also important; Public Safety agencies must be able to communicate throughout their jurisdictions — no matter how remote or congested. Systems must provide immediate

and reliable communications when lives are at stake and time is critical. Finally, Public Safety agencies must be able to communicate with each other. Whether as part of day-to-day operations or when disasters strike, cooperation is critical to ensuring that help is rapidly and effectively rendered. Interoperable communications systems are an absolute requirement.

- 1.5 Today, however, the radio systems used by the Public Safety community are laboring under increasing burdens. Equipment is old and funding for new equipment is often scarce. The radios used by different local agencies or different jurisdictions often cannot communicate with each other. The radio frequencies that Public Safety users rely on are heavily congested in many areas. As a result, assistance can be delayed and response efforts can be inefficient, which ultimately jeopardizes lives, both those of the officers and of the public at large. In addition to these current problems, as technology advances, new services, including advanced data and image/video applications, are becoming available that could enhance the Public Safety community's ability to fulfill its mission. The limited radio frequency spectrum allocated to Public Safety users, however, will make such new services impossible to implement.
- 1.6 To address these problems, the Federal Communications Commission (FCC or Commission) and the National Telecommunications and Information Administration (NTIA) of the Department of Commerce established the Public Safety Wireless Advisory Committee (PSWAC or Advisory Committee).

The Public Safety Wireless Advisory Committee (PSWAC)

History

- 1.7 The establishment of the PSWAC followed a long history of efforts by Congress, the FCC, the NTIA, and Public Safety organizations to address the spectrum requirements of Public Safety agencies. In 1983, Congress included as part of the FCC Authorization Bill a requirement that the Commission study Public Safety spectrum needs.¹ The Commission's Private Radio Bureau subsequently completed a Future Public Safety Telecommunications Requirements report which included projections of the amount of additional Public Safety spectrum that would be required in 21 metropolitan areas by the year 2000. The projections ranged from 12.5 MHz in Pittsburgh to 44.6 MHz in Los Angeles/San Diego. The FCC sought public comment on the report in PR Docket No. 84-232, but never took any further action in that docket.² In a separate proceeding, the Commission did allocate 6 MHz for Public

¹ *FCC Authorization Act of 1983, H.R. Report NO. 356, 98th Cong., 1st Sess. 27 (1983).*

² *Notice of Inquiry in PR Docket No. 84-232, 49 Fed. Reg. 9754 (Mar. 15, 1984).*

Safety in the 800 MHz band.³ There have been no further nationwide Public Safety allocations since that time.⁴

- 1.8 In 1993, as part of the legislation authorizing the use of spectrum auctions, Congress required the FCC to complete a study by February 9, 1995 of the current and future spectrum needs of State and local government Public Safety agencies through the year 2010, and develop a specific plan to ensure that adequate frequencies are made available to Public Safety licensees. On February 9, 1995, the FCC submitted to Congress a Report and Plan, Meeting State and Local Government Public Safety Agency Spectrum Needs Through the Year 2010. The Report and Plan did not contain specific conclusions or recommendations regarding Public Safety spectrum, but merely indicated that further study was necessary.
- 1.9 On March 22, 1995, during a hearing on FCC and NTIA appropriations, House Appropriations Subcommittee Chairman Harold Rogers expressed concern as to whether the Report and Plan was a sufficient response to Congressional concerns as expressed in the Omnibus Budget Reconciliation Act.⁵ He asked the FCC and the NTIA to develop a plan addressing the issue in much greater detail, which led to a letter from NTIA Administrator Larry Irving proposing the establishment of a joint advisory committee on Public Safety spectrum issues.⁶ As a direct result of that letter, the FCC and NTIA established the PSWAC on June 25, 1995, to provide advice on the specific wireless communications requirements of Public Safety agencies through the year 2010 and make recommendations for meeting those needs.

Charter

- 1.10 The PSWAC is chartered in accordance with the requirements of the Federal Advisory Committee Act.⁷ Its membership consists of senior members of Public Safety agencies, representatives of Public Safety organizations, and members of the private sector. The Advisory Committee is chaired by Philip L. Verveer, a partner with the firm of Willkie Farr & Gallagher. The members of the Steering Committee of the Advisory Committee are: the Honorable Louis Freeh, Director, Federal Bureau of

³ *Report and Order in GEN Docket No. 84-1233*, 2 FCC Rcd 1825 (1986).

⁴ The only exception to this statement is the fact that ten (10) 5 KHz channels in the 220 MHz band were granted in the mid 1990's as a block allocation of channels for use by Public Safety.

⁵ *Hearings Before the House Committee on Appropriations, Subcommittee on the Departments of Commerce, Justice, and State, the Judiciary, and Related Agencies*, 104th Cong., 1st Sess., Part 6, Telecommunications Issues, at 410 (March 22, 1995) ("*Hearings*").

⁶ Letter from Larry Irving, Assistant Secretary of Commerce to the Honorable Harold Rogers (Apr. 14, 1995) (reprinted in *Hearings* at 417-19).

⁷ 5 U.S.C. Appendix 2.

Investigation; the Honorable Howard Safir, Police Commissioner of the City of New York [William Bratton served until his resignation in the Spring of 1996]; the Honorable Michael Freeman, Fire Chief of Los Angeles County, California; the Honorable Alan D. Bersin, United States Attorney for the Southern District of California; Raymond W. Kelly, Undersecretary for Enforcement, Department of the Treasury [Ronald K. Noble served until his resignation in 1996] ; Harlin McEwen, Deputy Assistant Director, Federal Bureau of Investigation and senior official of the International Association of Chiefs of Police; Cindy Raiford, Deputy Director of Communications, Department of Defense; Steven Proctor, Technical Manager for Communications, State of Utah and past president of the Association of Public-Safety Communications Officials; Dennis Connors, Vice President, Ericsson, Inc.; and Fred Kuznik, Vice President, Motorola, Inc.⁸ The Advisory Committee was chartered to:

- 1.10.1 ▶ Advise the FCC and NTIA of specific operational wireless needs of the community including improvement of basic voice, data and E9-1-1 services, and the implementation of new wide-area, broadband telecommunications technologies for transmission of mugshots, fingerprints, video, and other high-speed data.
- 1.10.2 ▶ Advise the NTIA and FCC on options to provide for greater interoperability among federal, state, and local Public Safety entities.
- 1.10.3 ▶ Advise the FCC and NTIA on options to accommodate growth of basic and emerging services, including bandwidth vs. functional requirement trade-offs, technical options, and other options.
- 1.10.4 ▶ Advise the NTIA and FCC on the total spectrum requirements for the operational needs referred to above, including frequency band options, shared/joint spectrum use options, and other options.⁹

Structure of the Committee

- 1.11 The PSWAC consists of a Steering Committee and five (5) functional subcommittees. The Steering Committee exercised overall direction of the work of the subcommittees and was responsible for reviewing their output. The subcommittees were created to address specific areas of concern:

⁸ Several members of the Steering Committee were represented on occasion by alternates. The alternates for the members of the Steering Committee of the Advisory Committee are: Tyrel W. Hayton, Federal Bureau of Investigation, for Director Freeh; Michael Amarosa, Deputy Commissioner for Technology and Systems Development, Police Department of the City of New York, for Commissioner Safir; Raymond A. Barnett, United States Secret Service, Department of the Treasury, for Undersecretary Kelly; and Debra A. Gross, Commander, USN, Office of the Assistant Secretary of Defense Command, Control, Communications and Intelligence, for Deputy Director Raiford.

⁹ Charter of the Public Safety Wireless Advisory Committee (filed June 26, 1995).

Table 1-1

<p><i>Operational Requirements Subcommittee</i></p> <p><i>(ORSC)</i></p>	<p>The Operational Requirements Subcommittee was chaired by Mr. Paul H. Wieck, Commissioner, Iowa Department of Public Safety. The alternate for Commissioner Wieck was Mr. Craig Allen, Lieutenant, Illinois State Police. This subcommittee was charged with identifying the communication needs of the Public Safety community to the year 2010. It focused on requirements that are currently unmet or suffer from reliability, quality, or coverage deficiencies. The subcommittee also examined the new services being made available by advances in both wide- and narrowband technology.</p>
<p><i>Technology Subcommittee</i></p> <p><i>(TESC)</i></p>	<p>The Technology Subcommittee was chaired by Mr. Alfred Mello, Chairman of the Public Safety Communications Council. The alternate for Mr. Mello was Mr. Richard DeMello, Forestry Conservation Communications Association. This subcommittee reviewed the technologies now used by Public Safety and identified the emerging technologies that may serve Public Safety agencies' needs in the future. A special focus was on those technologies that offer advances in spectral efficiency or new services to meet the community's growing needs.</p>
<p><i>Interoperability Subcommittee</i></p> <p><i>(ISC)</i></p>	<p>The Interoperability Subcommittee was chaired by Mr. James E. Downes of the U.S. Department of Treasury. This subcommittee defined "Public Safety" and "interoperability" for purposes of the <i>Final Report</i> and examined the specific problems of interoperability between Public Safety agencies. The group detailed the needs for interoperability among and between Public Safety agencies and the varying circumstances in which it must be available.</p>
<p><i>Spectrum Requirements Subcommittee</i></p> <p><i>(SRSC)</i></p>	<p>The Spectrum Requirements Subcommittee was chaired by Mr. Richard N. Allen of the Federal Bureau of Investigation. Based on the work of the above subcommittees, this subcommittee was charged with determining the specific spectrum requirements that will need to be met in order for Public Safety agencies to perform their missions in the most effective manner. It evaluated current spectrum allocations and usage, and made recommendations on future allocations and use.</p>

Table 1-1

<p><i>Transition Subcommittee</i></p> <p><i>(TRSC)</i></p>	<p>The Transition Subcommittee was chaired by Mr. James R. Rand, Executive Director of the Association of Public Safety Communications Officials International, Inc. The alternate for Mr. Rand was Mr. Ali Shahnam, Association of Public Safety Communications Officials International, Inc. The assistant to Mr. Rand was Mr John Ramsey, also of the Association of Public Safety Communications Officials International, Inc. This subcommittee was charged with examining the mechanisms necessary to improve Public Safety wireless communications over the next 15 years. The subcommittee addressed spectrum management practices, funding alternatives, and regulatory changes necessary to effect the goals of the Advisory Committee.</p>
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- 1.12 The meetings of the Steering Committee and the subcommittees were open to the public. Steering Committee and subcommittee meetings were held in various locations around the country to encourage maximum public participation. Over 480 individuals, representing all areas of the manufacturing, service, the Public Safety user communities, and the general public participated in the work of the subcommittees.
- 1.13 The drafting of the *Final Report* was supervised by Michael Amarosa, Deputy Commissioner for Technology and Systems Development, Police Department of the City of New York; Raymond A. Barnett, United States Secret Service, Department of the Treasury; and Steven Proctor, Technical Manager for Communications of the State of Utah and past president of the Association of Public-Safety Communications Officials.

The PSWAC Final Report

- 1.14 This *Final Report* of PSWAC to the FCC and NTIA represents the views of the PSWAC Steering Committee. The *Final Report* is predicated upon the work of the subcommittees, but departs from the various subcommittee reports in some respects. It examines the problems confronting the Public Safety community now and identifies the wireless communication needs of the community to the year 2010. The *Final Report* also discusses the technologies available, now and in the future, to meet those needs, the spectrum and interoperability requirements of the community, and the transition mechanisms that will be required to bring Public Safety communications up to expected levels of performance, efficiency, and effectiveness. The recommendations embodied in this report are advanced with varying degrees of certitude. Some, especially those susceptible to near term implementation, are quite specific. Some are more general. Overall, they represent the Steering Committee's collective judgement with respect to changes necessary to maintain and improve Public Safety communications functions in the United States. The work of each subcommittee

is summarized later in this report, and the full reports from each are included as appendices.

Federal Regulation of Public Safety Radio Services

Congressional Mandates to Regulate Public Safety Spectrum

- 1.15 By statute, the NTIA manages the Federal government's use of the spectrum, while the FCC manages all non-federal spectrum usage. The two agencies are charged with jointly developing the National Table of Frequency Allocations and a comprehensive long-range plan for improved management of all radio spectrum resources. NTIA's policies and procedures are described in the Manual of Regulations and Procedures for Federal Radio Frequency Management (NTIA Manual), with similar guidance for the FCC contained in Title 47 of the Code of Federal Regulations.
- 1.16 NTIA policy and technical analysis responsibilities include the development of long range spectrum planning and policy, the review of proposed federal radio communication systems to make sure that sufficient spectrum is available for their compatible operation, the analysis and resolution of interference problems involving federal radiocommunication systems, and the analysis of spectrum use in selected bands. These responsibilities hold both internationally, through a leadership role in the preparations for conferences/meetings of the International Telecommunication Union (ITU), and domestically, where NTIA chairs, and provides administrative and analytic support to the Interdepartment Radio Advisory Committee (IRAC). The IRAC, established in 1922, comprises representatives of the major spectrum-using federal agencies as well as a representative from the FCC to provide liaison with non-federal users of the spectrum. The IRAC provides the primary advice to NTIA regarding issues of concern to the Federal government spectrum-using community.
- 1.17 Congress has directed both the FCC and NTIA to effectuate reforms in the mobile services spectrum each manages. Section 332(a) of the Communications Act requires the FCC to reduce regulatory burdens on spectrum users, improve efficient spectrum use and overall efficiency, increase interservice sharing opportunities between mobile providers and other services, encourage competition, and ensure the safety of life and property.¹⁰ The Telecommunications Authorization Act of 1992 imposed similar obligations on the NTIA to ensure efficient use of Federal government spectrum.¹¹ The recommendations contained in this report parallel these mandates. The Steering Committee believes that the FCC should avoid regulatory structures that emphasize

¹⁰ 47 U.S.C. 332 (a). See also section 1 of the Communications Act, which emphasizes similar policy objectives.

¹¹ 47 U.S.C. 903 (d)(1)